
Technology in Rural Transportation

“Simple Solution” #8

ENTERPRISE

United States Department of Transportation
Federal Highway Administration
Federal Transit Administration

Mobile Weather Sensors



Introduction

This application was identified as a promising rural Intelligent Transportation Systems (ITS) solution under a project sponsored by the Federal Highway Administration (FHWA) and the ENTERPRISE program. This summary describes the solution as well as opportunities for expansion into the broader context of rural ITS.

Technology Overview

Winter weather road maintenance constitutes a significant effort, especially in northern states. The objective of this solution is to increase the efficiency and cost-effectiveness of applying anti- and de-icing materials to the road surfaces by monitoring the weather and road conditions on-site with the maintenance vehicles.

Real-world Example - Infrared Pavement Sensor Monitoring

Overall goal: To monitor pavement temperatures at the site of maintenance vehicles to assist in the snow removal process.

Technical approach: An infrared (IR) sensor, which monitors pavement temperatures, is installed on maintenance patrol trucks. As air temperatures and pavement temperatures often differ widely, this enables the operators to concentrate the application of materials on the most appropriate areas. Continuous sensor readings are displayed on a unit inside the truck cab as the vehicle drives at highway speeds. (As implemented by the agencies identified below, there is no communication of these temperatures to a central dispatch / maintenance center.) Application rates are determined manually by the vehicle operator by combining the reported pavement temperature with a visual estimate of the ice or snowpack thickness.

Current status: The system has been in use in at least one site since the winter of 1994-1995. The sensors are commercially available.

Location / geographic scope: Areas using this system include the states of Vermont and Indiana. The system can be used at any location where the application of anti- and de-icing materials to the road surface is required.

Agencies involved: Vermont DOT, Indiana DOT. Vermont's sensor supplier is Control Products, Inc.

Cost information: The IR sensors cost approximately \$2,300 each.

Key contact: Control Products Inc. (360) 571-0988

Have goals been achieved? Yes.

Solution timeline: Indiana reports that they are deploying systems on additional trucks as money becomes available.

Further Description of Application

Additional technologies may include:

Various types of sensors are under development which are aimed towards improving the efficiency of winter maintenance activities. However, the costs associated with some of these technologies may make them prohibitive for some agencies.

Potential additional uses for this technology may include:

If a sufficient numbers of maintenance vehicles were equipped with these sensors, data could be relayed to a central collection point and contribute to a regional or state-wide road and weather condition information system. Information collected from sensors could be communicated to other maintenance personnel and, when appropriately repackaged, could also feed into traveler information systems.

Benefits of Application

	Benefits to travelers / the community	Benefits to business / industry	Benefits to the public sector
Direct benefits	Safer travel on roads in inclement weather episodes due to quicker and more appropriate application of materials	Greater reliability in deliveries and provision of services in winter conditions due to quicker and more appropriate application of materials network as materials	Improved cost efficiency in applying materials to the road surface only where required Quicker coverage of road application is optimized

Probable Implementation Process

- Step One:** An interested agency should assess its spending on winter maintenance activities, in terms of operator salaries and overtime payments, equipment investments and depreciation, and materials. If possible, agencies who have already implemented the system should be contacted to determine the savings which they have achieved through using the sensor system.
- Step Two:** Once it has been determined with reasonable confidence that savings could be gained through implementing the system, resources must be identified and allocated to purchase sensor units. Resources for sensor installation and maintenance will also be required. An implementation schedule should be created. Manufacturer discounts may be available if agencies can commit to purchasing a certain number of units in a given timeframe.
- Step Three:** Sensors and the required in-vehicle equipment should be procured, installed, and tested.

Potential Implementation Issues

Due to the pressures on winter maintenance budgets, equipping vehicles with such systems may be perceived as a low priority for some agencies. Therefore, the potential savings in time and materials which could be gained from the use of these technologies should be emphasized wherever possible. As has been the case in those areas which are already using the sensing systems, maintenance vehicles could be equipped in an incremental process, as resources become available.

Solution's Contribution to Broader Rural ITS Developments

While this solution would not provide the only pavement temperature source, it could provide invaluable supplemental information to a Road / Weather Information System (R/WIS) by providing "roving" information concerning a far broader portion of the road network than a fixed R/WIS is able to, thus extending the scope of the pavement condition data beyond the current micro-scale. This solution could play a key role in rural ITS as follows:

Roadway Management - Improved roadway maintenance during inclement weather will contribute to an overall management system for the roadway.

The Technology in Rural Transportation: "Simple Solutions" Project

This project was performed within the ENTERPRISE pooled-fund study program, and aimed to identify and describe proven, cost-effective, "low-tech" solutions for rural transportation-related problems or needs. "Simple solutions" studied within the project focussed on practical applications of technologies, which could serve as precursors to future applications of more advanced systems, or intelligent transportation systems (ITS).

More than fifty solutions were initially identified and documented. Of these, fourteen solutions were documented and analyzed in detail. The transportation technology applications were also categorized according to the seven Critical Program Areas (CPAs) defined within the U.S. Department of Transportation's Advanced Rural Transportation Systems Program. It is hoped to utilize the information gathered within this study to perform outreach to local level transportation professionals to introduce them to ITS and its potential benefits.

For More Information: A full report on this study is available from the FHWA R&T Report Center, telephone no. 301-577-0818. **Title:** Technology in Rural Transportation: "Simple Solutions."
Publication No.: FHWA- RD-97-108. This research was conducted by Castle Rock Consultants, Eagan, Minnesota. For more information, contact Paul Pisano of FHWA, HSR-30, 703-285-2498. For more information about ENTERPRISE, contact Bill Legg, Washington State DOT, 206-543-3332.